

On the Organization and Development of the Gordii.—Second Note*.
By M. A. VILLOT.

In the *Gordii* the adult state is characterized by the atrophy of the digestive apparatus, and the development of the generative organs, the integuments, the muscular apparatus, and the nervous system.

The integuments have not the complex structure that Dr. O. von Linstow has recently attributed to them. We can only distinguish in them two layers—a superficial structureless layer scarcely measuring 0.001 millim., and a deeper one, formed of intercrossed elastic fibres, more or less strongly coloured, and having an average thickness of 0.029 millim. These two layers correspond to the cuticle of the Nematoids, and do not differ from it in origin. The elastic fibres which constitute the deep layer are only differentiated towards the close of the second larval period.

The description that I have given of the nervous system is very naturally explained by organogeny, and is not without analogy to that which is accepted for other animals. The relations of continuity which exist between the cerebroid organ, the ventral cord, and the hypoderm are shown by longitudinal and transverse sections. These are facts which I have been the first to indicate, and which possess a certain value, independently of any physiological interpretation. In the larva of *Gordius* we find, in place of the cerebroid organ, an actual ring which gives passage to the œsophagus, and is the homologue of that which is observed in all Nematoids. The transformation of the œsophageal collar into a cephalic ganglion in the adult *Gordii* is the consequence of the disappearance of the œsophagus. The union of the medullary centres into a single cord situated in the ventral region is the result of the fact of the non-existence in the *Gordii* of lateral areas, submedian lines, or dorsal line. This important character fully justifies the creation of a special order for the genus *Gordius*; it approximates these animals to the *Sipunculi*, and in this way establishes a well-marked passage from the class of Helminthes to that of the Gephyrea. The network of fibres and cells which constitutes the hypoderm is placed beyond doubt by means of suitably directed sections and the employment of colouring-matter; and its ascription to the nervous system has nothing startling in it when we consider the transitory forms which this apparatus assumes among the superior types of the animal kingdom. The nervous system of the *Gordii* is arrested at that phase of development which represents the differentiation of the medullary centres by gemmation from the ectodermic lamella. Although still intimately united with the hypoderm, their ventral cord has already passed the muscular zone and penetrated into the middle region of the body. It is the same organogenic phase that we observe in the adult Nematoids; but here the differentiation of the nervous centres appears to be less advanced. It is still less so in the Polygordians. *Polygordius Villoti* has a ventral cord of very flattened form, situated beneath the muscular layer and in imme-

* See 'Annals,' August 1880, p. 169.

diate contact with the hypoderm. The nervous system of the *Gordii* is endowed with very remarkable absorbent properties, which may, under certain conditions, give it the appearance of a true vascular apparatus. Water penetrates into it with the greatest facility, and causes in it singular alterations as soon as the animal loses some of its vitality. The cells of the hypodermic network dilate and become pyriform; the epidermis of the papillæ also swells and becomes prolonged exteriorly in the form of tubes or long filaments. These alterations have been described by Möbius and Grenacher as normal and integral parts of the animal; by Von Siebold and myself as parasitic Algæ.

The muscular elements of the *Gordii* are derived from the embryonic cell by a series of very simple modifications. The myoblast, by elongation and lateral compression, passes from the spherical form to the ribbon-like state. The envelope of the cell constitutes the myolemma; and its contents (protoplasm and nucleus confounded together) become converted into contractile substance. The latter condenses against the cell-wall and divides into longitudinal fibrillæ parallel to the longer axis of the fibre. The thickness of the muscular layer thus increases in the direct ratio of the lateral flattening of the embryonic cells. This process of formation, which is common to the Nematoids, the Gordians, and the Polygordians, attains its maximum of development in the last-named.

The atrophy of the digestive apparatus consists principally in the disappearance of the mouth and œsophagus. The so-called "secretory organ," described by Meissner in the adult *Gordii*, is nothing but the intestine. Its true nature is attested by the fact that in the larvæ it is in relations of continuity with the mouth and œsophagus. In the adults we see that it opens posteriorly into the cloaca, and that in front it terminates below the cephalic ganglion in a very slender cæcum. The contraction of the anterior extremity of the intestine results both from the degenerescence of its tissues, and from a sort of constriction caused by the connective fibres of the parenchyma.

The divisions of the cloaca of the female, which Grenacher has designated by the names of *seminal receptacle*, *uterus*, and *cloaca proper*, do not correspond either to differences of structure or to differences of function.

As to the parenchyma it is constituted by very diverse anatomical elements. Some parts remain, even in the adults, in the state of embryonic tissue; others pass to the condition of connective or even of cartilaginous tissue. By making transverse sections upon the cloaca of the females, we can see how these different tissues are derived from each other; in fact we can distinguish in them four well-characterized zones; the most inferior is entirely composed of embryonic cells, not yet modified, but already in course of proliferation; the second zone is formed of cells having all the properties of the cartilaginous cell; the third zone shows the passage from the cartilaginous cell to the connective corpuscle; the fourth and last zone is represented by normal connective tissue, such as is observed in most of the inferior animals.—*Comptes Rendus*, Nov. 8, 1880, p. 774.